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1.4

FORMERLY USED DEFENSE SITE
LARSON AFB
TITAN MISSILE FACILITY S-2
INITIAL INVESTIGATION

USEPA SF



1229290

FORMERLY USED DEFENSE SITE

LARSON AFB TITAN MISSILE FACILITY S-2

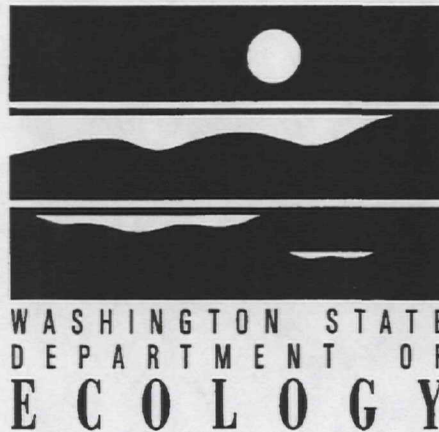
WASHINGTON STATE DEPARTMENT OF ECOLOGY

January 7, 2000

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Environmental Cleanup Office



Prepared by Guy Barrett, Toxics Cleanup Program

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A

**Initial Investigation at the Formerly Used Defense Site
Larson AFB Titan Missile Facility S-2**

A. Introduction

The Washington State Department of Ecology (Ecology) Toxics Cleanup Program has decided to perform initial investigations, including sampling, at eight Formerly Used Defense Sites (FUDS) in Washington State which have previously been classified as requiring No Further Action (NoFA) by the Seattle District Corps of Engineers. The FUDS Larson AFB Titan Missile Facility S-2 is one of these sites.

The subject site, former Larson AFB Titan Missile Facility S-2, is located in Grant County near Warden, Washington at latitude 46 degrees, 56 minutes, 41.31 seconds and longitude 119 degrees, 2 minutes, and 14.52 seconds. The site was formerly used by the Air Force between 1962 and 1966 as a Titan I ICBM facility. Aboveground structures included a "hard" launch facility, with three missile launch complexes, each with three vertical missile silos, propellant and equipment terminals, two radar antennae silos, air intake and exhaust structures, control center, powerhouse, access portal, and an interconnecting steel tunnel system.

Various hazardous, flammable and/or explosive materials were used, stored and disposed of on-site during the period of operation of the facility. These include diesel oil, RP-1 fuel (kerosene), lubrication oil, hydraulic oil, solvents, degreasers, transformer fluids (PCB's), nickel-cadmium batteries, liquid oxygen, nitrogen and helium.

The site was declared excess in 1966 and salvage operations removed most of the equipment and supplies. In 1970 the silos were used for liquid manure and chemical fertilizer storage. A methanol fuel plant was constructed and abandoned after short usage and the facility now stands vacant and unused.

The Model Toxics Control Act, (MTCA) Ch. 70.105D RCW, authorizes Ecology to adopt rules necessary to identify, investigate, and clean up hazardous waste sites in Washington State. The regulation Ecology has adopted, Ch. 173-340 WAC, clarifies the roles of both Ecology and owners or operators of facilities where hazardous substances have come to be located, and encourages public involvement in the decision-making at these facilities.

B

B. Executive Summary

Ecology's investigation is designed to confirm or deny the presence of potential soil and groundwater contamination resulting from past Department of Defense practices. The overall goal of the proposed investigation is to determine the need for additional investigation or to support the belief that no further investigation or cleanup activity is warranted.

The original site is located near Warden in Grant County, Washington at latitude 46 degrees, 56 minutes, 41.31 seconds and longitude 119 degrees, 2 minutes, and 14.52 seconds (Figure 1). The Department of the Air Force acquired 295.94 acres between 1959 and 1961 by negotiated purchase or donation for construction of a Titan Intercontinental Ballistic Missile (ICBM) launch site. The Air Force constructed a "hard" launch facility with an underground complex consisting of three missile launch complexes, each with three missile silos, propellant and equipment terminals, two radar antenna silos, air intake and exhaust structures, powerhouse, control center, access portal, and an interconnecting tunnel.

Ecology obtained samples on November 18, 1999 at only a few select locations in upland soil. Based on analysis of the soil samples, Ecology found that contaminants are present which exceed cleanup levels. Lubricating oil was found exceeding state cleanup levels.

c

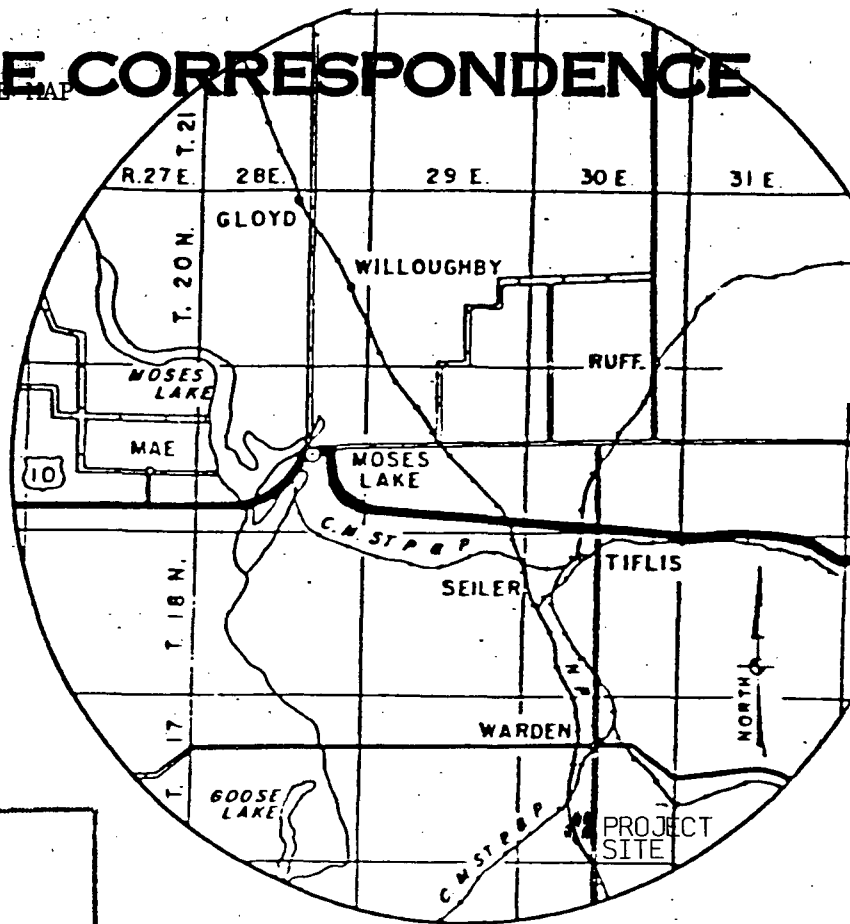
C. Sampling Locations

Mr. and Mrs. Bob Echols of Access Realty in Warden, described historical locations of potential sources of contamination that had not been beneficially used at this site, at least to their knowledge, since DOD vacated the property. Following this, an inspection of the buildings and undeveloped areas allowed Ecology to refine sampling locations. A general layout of the Larson AFB Titan Missile Facility S-2 site is provided with sampling locations identified (Figure 2). At each sample location, soil was collected from a depth interval of 0 to 2 inches with clean, stainless steel spoons and placed in pre-cleaned sample jars provided by Manchester Laboratory. Sample containers were labeled at the time of sampling with the project name, sampler's initials, sample location and depth, analysis to be performed, date, and time. Samples were transferred with a completed chain of custody form to the Manchester Laboratory including sample identification, sampler's signature, date and time of sample collection, sample matrix, signatures of others in the chain of possession, and inclusive dates of possession. Sampling equipment that was not disposable was decontaminated by scrubbing and rinsing with distilled/deionized water. Sampling activities were documented in a field logbook. Samples were shipped to the lab in a cooler cooled to 4 degrees Celsius with ice and in a manner to ensure that holding times were not exceeded.

2

EXECUTIVE CORRESPONDENCE

ATTACHMENT NO. 1 SITE MAP



6 3 0 6 12
SCALE IN MILES

VICINITY MAP

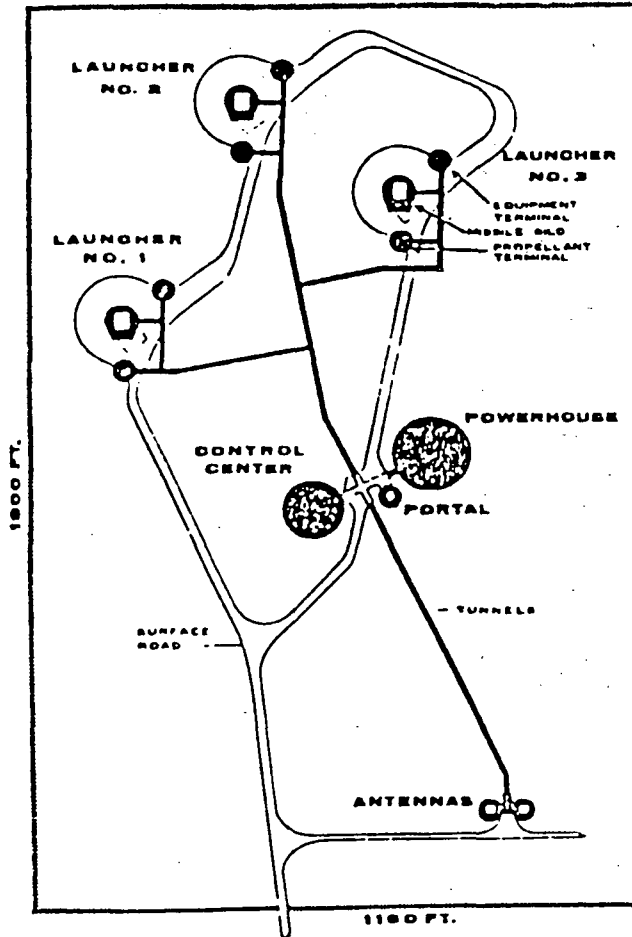
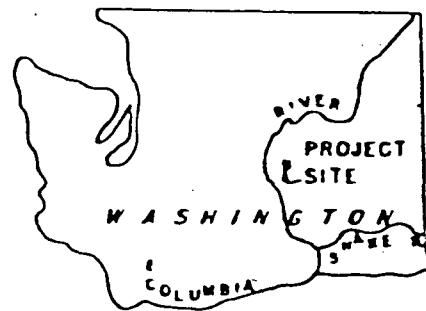


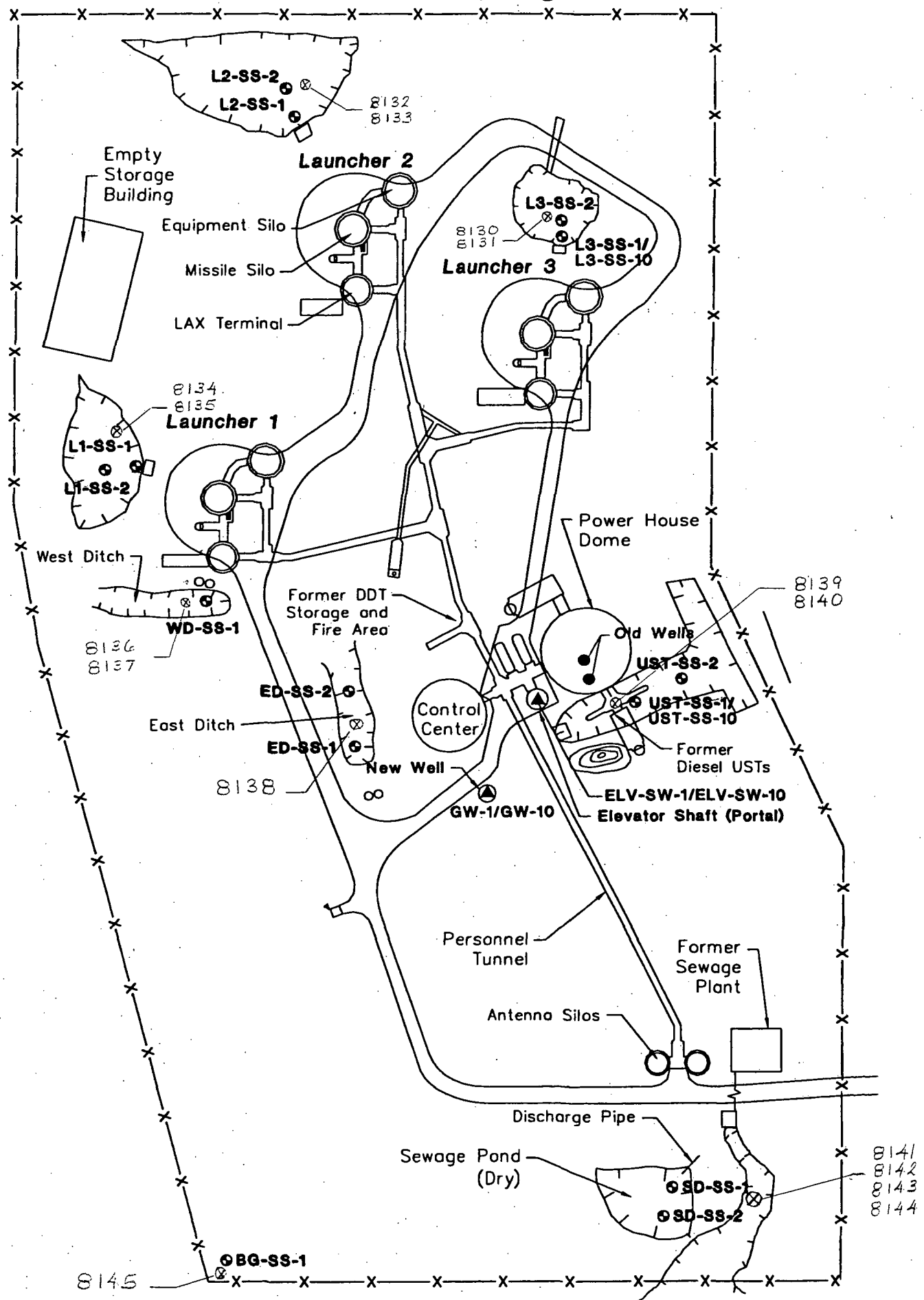
FIG. 1.—TYPICAL LAUNCH COMPLEX



STATE INDEX

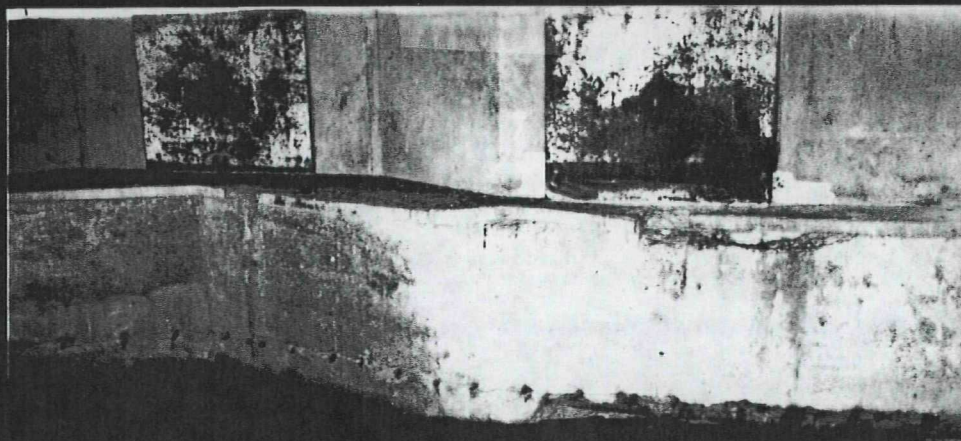
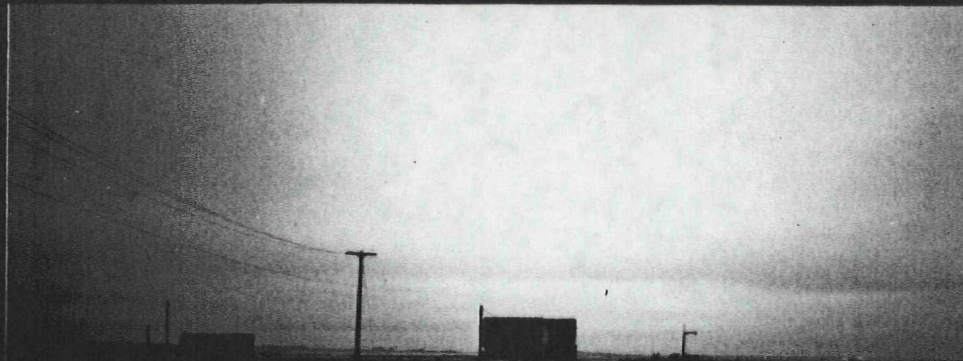
DO NOT WRITE ON THIS COVER AS IT IS INTENDED FOR RE-USE
RETURN IT WITH THE FILE COPIES TO ORIGINATING OFFICE
WARDEN, GRANT COUNTY, WASHINGTON

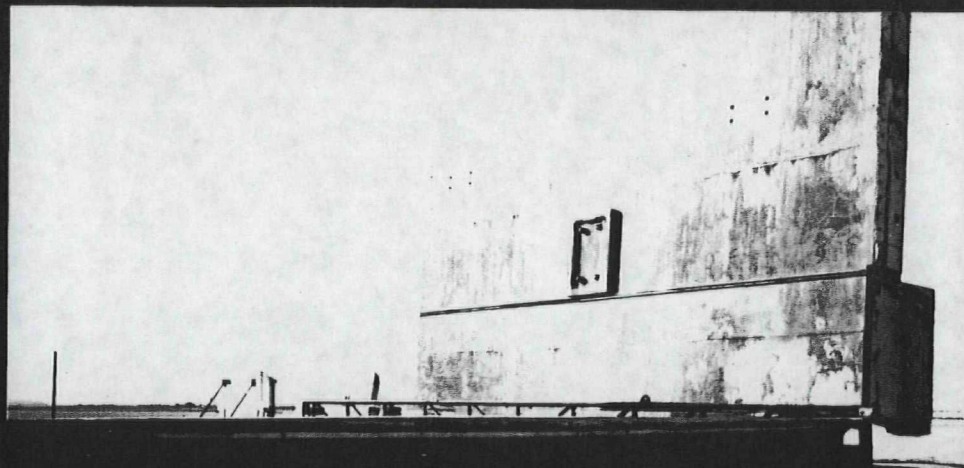
Missile Site Soil and Water Sampling Location Plan

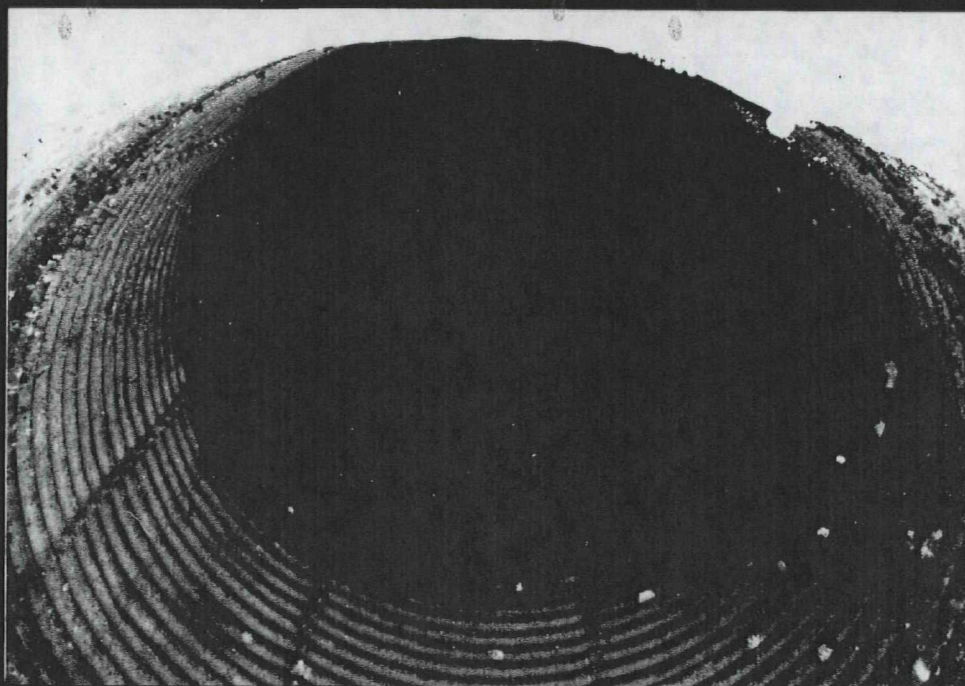
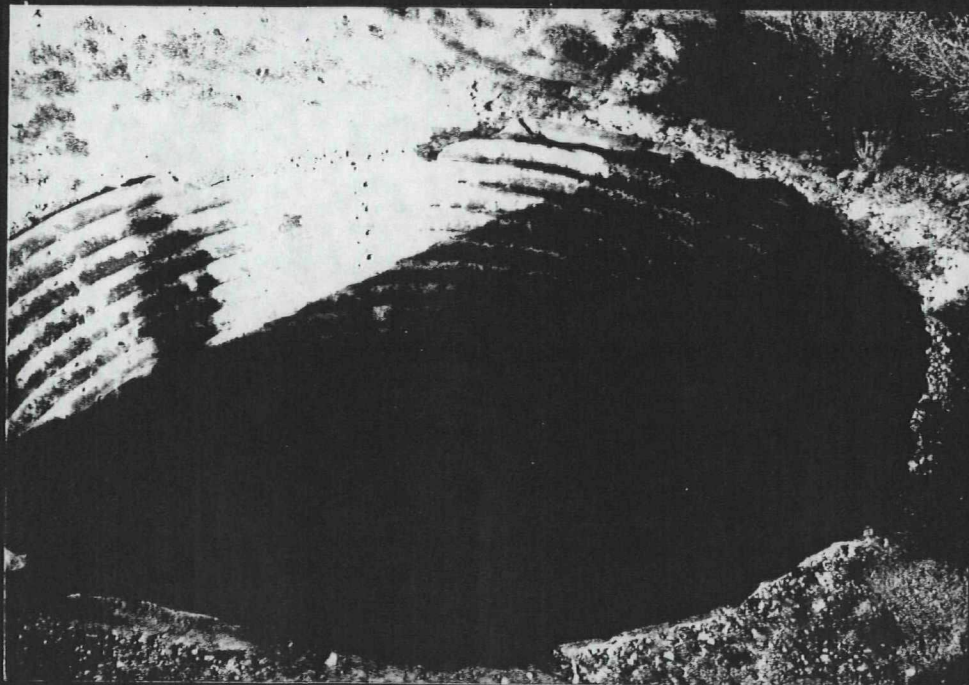


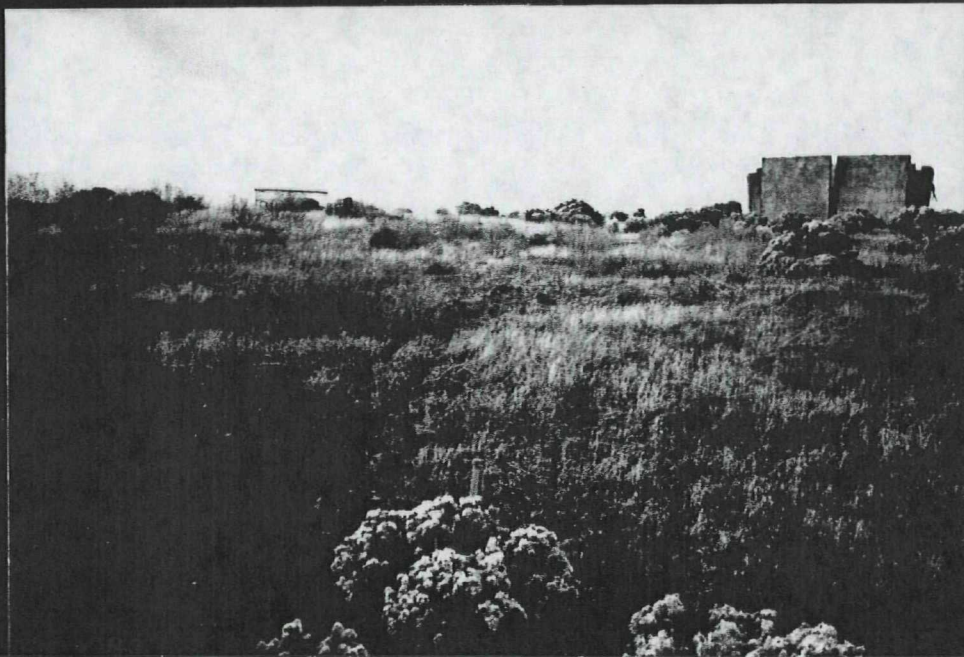
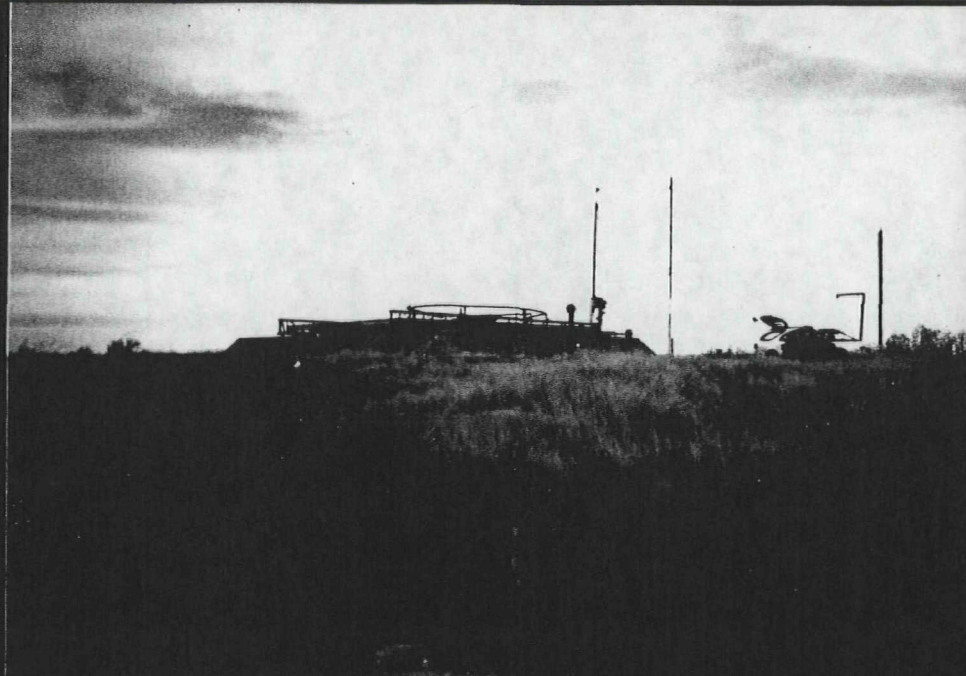












E

6-18-86

T. Fackelman

FINDINGS REGARDING THE POTENTIAL PRESENCE OF HAZARDOUS
MATERIALS AT WARDEN ICBM SITE

One purpose of the DERA investigations is to investigate the possibility that formerly owned or formerly occupied DOD properties such as the property that is the subject of this report, may have residual hazardous materials contamination that could be attributed to former DOD property uses. Hazardous materials contamination resulting from activities on the property prior to or after DOD use is not the subject of this report and was not investigated.

The site of the former Warden ICBM facility was surveyed on May 29, 1986. Information on the site was obtained by discussions with the current owners of the site, a visual inspection of the aboveground features of the site, and a review of existing agency documents. No below ground survey was made.

During the period of DOD use, a number of hazardous materials was used to support facility activities including large quantities of fuel oil and liquid oxygen and smaller quantities of compressed nitrogen, ethylene glycol, and miscellaneous industrial cleaners and solvents. No evidence of the presence of hazardous materials attributable to DOD use of the property was found. The current owners indicated that the former fuel oil tanks were not salvaged. These may warrant further inspection and sampling of any liquid or sludge contents. It is believed that two deep wells exist in the powerhouse structure. Since these could have provided a conduit for groundwater contamination they should be sampled, if possible.

Post-DOD alterations to the design of the facility for use as liquid propane storage and subsequently for liquid fertilizer storage may impede future investigations and may make it difficult or impossible to distinguish between problems resulting from DOD use or post-DOD uses.

F



DEPARTMENT OF THE ARMY

NORTH PACIFIC DIVISION, CORPS OF ENGINEERS

P.O. BOX 2870

PORTLAND, OREGON 97208-2870

REPLY TO
ATTENTION OF:

CENPD-PM-MP (200-1a)

19 NOV 1992

MEMORANDUM FOR

✓ Commander, Seattle District, P.O. Box C-3755, Seattle, Washington
98124-2255

Commander, U.S. Army Corps of Engineers, Huntsville Division,
(CEHND-PM), P.O. Box 1600, Huntsville, Alabama 35807-4301

SUBJECT: Defense Environmental Restoration Program for Formerly
Used Defense Sites (DERP-FUDS); Inventory Project Report (INPR)
for Site No. F10WA035000, Larson AFB Titan Missile Facility
S-2, Warden, Grant County, Washington

1. This memorandum approves the No Further Action (NOFA)
recommendation.

2. Request that:

a. CENPS, within sixty days of the date of this memorandum,
notify landowners of the decision and provide copies of the
notification letter(s) to CEMP-RF, CEHND-PM, and
CENPD-PM-MP.

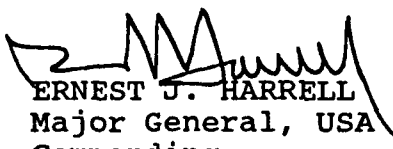
b. CENPS update CEHND Inventory database.

c. CEHND file this INPR.

3. The CENPD-PM-MP POC for this action is Mr. Moon-Yong Han,
P.E., (503) 326-7361.

Encl
Memo, CENPS-EN-GT-HW,
30 Sep 92

CF (w/encl):
CEMP-RF


ERNEST J. HARRELL
Major General, USA
Commanding



DEPARTMENT OF THE ARMY
SEATTLE DISTRICT, CORPS OF ENGINEERS
P.O. BOX 3755
SEATTLE, WASHINGTON 98124-2255

SEP 30 1992

REPLY TO
ATTENTION OF


CENPS-EN-GT-HW (200-1a)

MEMORANDUM FOR Commander, U.S. Army Engineer Division, North
Pacific, ATTN: CENPD-PM-MP, P.O. BOX 2870,
Portland, Oregon 97208-2870

SUBJECT: Defense Environmental Restoration Program for Formerly
Used Defense Sites (DERP-FUDS) Inventory Project Report (INPR)
for Site No. F1OWA035000, Larson AFB Titan Missile Facility S-2,
Warden, Grant County, Washington

1. The enclosed INPR presents the DERP-FUDS Preliminary Assessment (PA) for the above former missile facility. A site visit was conducted in May 1986. The site survey summary sheet and site map are included in the INPR.
2. We have determined that the site was formerly used by the Air Force. A recommended "Findings and Determination of Eligibility" (FDE) is included in the INPR.
3. Also, we have determined there is no potential for hazardous waste at the site which would be eligible for cleanup under DERP-FUDS, and that no further investigation is warranted.
4. We recommend:
 - a. No further action (NOFA) be taken on this site.
 - b. Approving and signing the FDE;
 - c. Forwarding a copy of this INPR to CEHND for the PA file;

Encl


WALTER J. CUNNINGHAM
Colonel, Corps of Engineers
Commanding

SITE SURVEY SUMMARY SHEET
FOR
DERP-FUDS SITE NO. F10WA035000
LARSON AFB TITAN MISSILE FACILITY S-2, WARDEN
SEPTEMBER 1992

SITE NAME: Larson AFB Titan Missile Facility S-2 (Warden).

LOCATION: The site is approximately 16 miles southeast of Moses Lake, Grant County, Washington; see site map attached.

SITE HISTORY: This site was used by the Air Force between 1962 and 1966 as a Titan I ICBM facility. Aboveground structures consisted of a gatehouse, entry portal, air intake and exhaust structures, sewage stabilization pond, spray pond, and security fencing. Subterranean construction consisted of a "hard" launch facility, with three missile launch complexes, each with three vertical missile silos, propellant and equipment terminals, two radar antenna silos, air intake and exhaust structures, control center, powerhouse, access portal, and an interconnecting steel tunnel system. Two deep wells, one 981 feet and one 1000 feet, supplied the water for the two 30,000 gallon underground water tanks which serviced the facility.

Various hazardous, flammable and/or explosive materials were used, stored and disposed of on-site during the period of operation of the facility. These included diesel oil, RP-1 fuel (kerosene), lubrication oil, hydraulic fluids, solvents, degreasers, transformer fluids (PCB's), nickel-cadmium batteries, liquid oxygen, nitrogen and helium. In most cases, these substances were held in tanks housed inside the facility or buried adjacent to it. Storage capacities indicate the following volumes of selected substances were present routinely at the site: 40,000 gallons of RP-1; 134,000 gallons of diesel oil; 24,500 gallons of liquid gas, 78,000 gallons of liquid oxygen; 3500 gallons of sulphuric acid, and nine clusters of high pressure tanks containing helium and nitrogen.

The Warden site was declared excess in 1966, and an accelerated program of salvage by private contractors under the direction of the Air Force followed. Salvage operations were extensive and evidently rapid. Generators, electrical equipment and supplies, motors, fixtures and storage tanks were frequently removed in such operations. In 1967, the property was sold to Underground Storage, Inc., who continued to salvage material from the site. In 1970, the property was purchased by Lennington and Ash, the current owners, under the partnership Titan Storage, Inc. The silos were then adapted for liquid manure and chemical fertilizer

Larson AFB Titan Missile Facility S-2, Warden

F10WA035000

storage, which is how they are still used. In 1976, the current owners sold two acres of the original fee property to a group involved in methanol production. A methanol fuel plant was constructed on the site but was soon abandoned for economic reasons. The facility is now vacant and unused.

SITE VISIT: A site inspection was made on 29 May 86 by Robert S. Anderson of R.S. Anderson/Land Use Planning and Anton M. Fackelman of Tetra Tech, Inc., under contract to Seattle District. Jonathan Maas from the Corps of Engineers, and Marvin Lennington and Alvin Ash, co-owner's of the site, also participated. No potential DOD landfill areas were detected during the site visit. No evidence of underground storage tanks (UST's) was noted. No other visible signs of hazardous waste were found at the site.

CATEGORY OF HAZARD: No DOD-caused hazards were identified.

PROJECT DESCRIPTION: No project is proposed.

AVAILABLE STUDIES AND REPORTS: Various historical documents (e.g. site plans, aerial photographs) and real estate records.

SEATTLE DISTRICT POC: Jonathan A. Maas, CENPS-EN-GT-HW, (206) 764-6745.

ATTACHMENT NO. 1 - SITE MAP

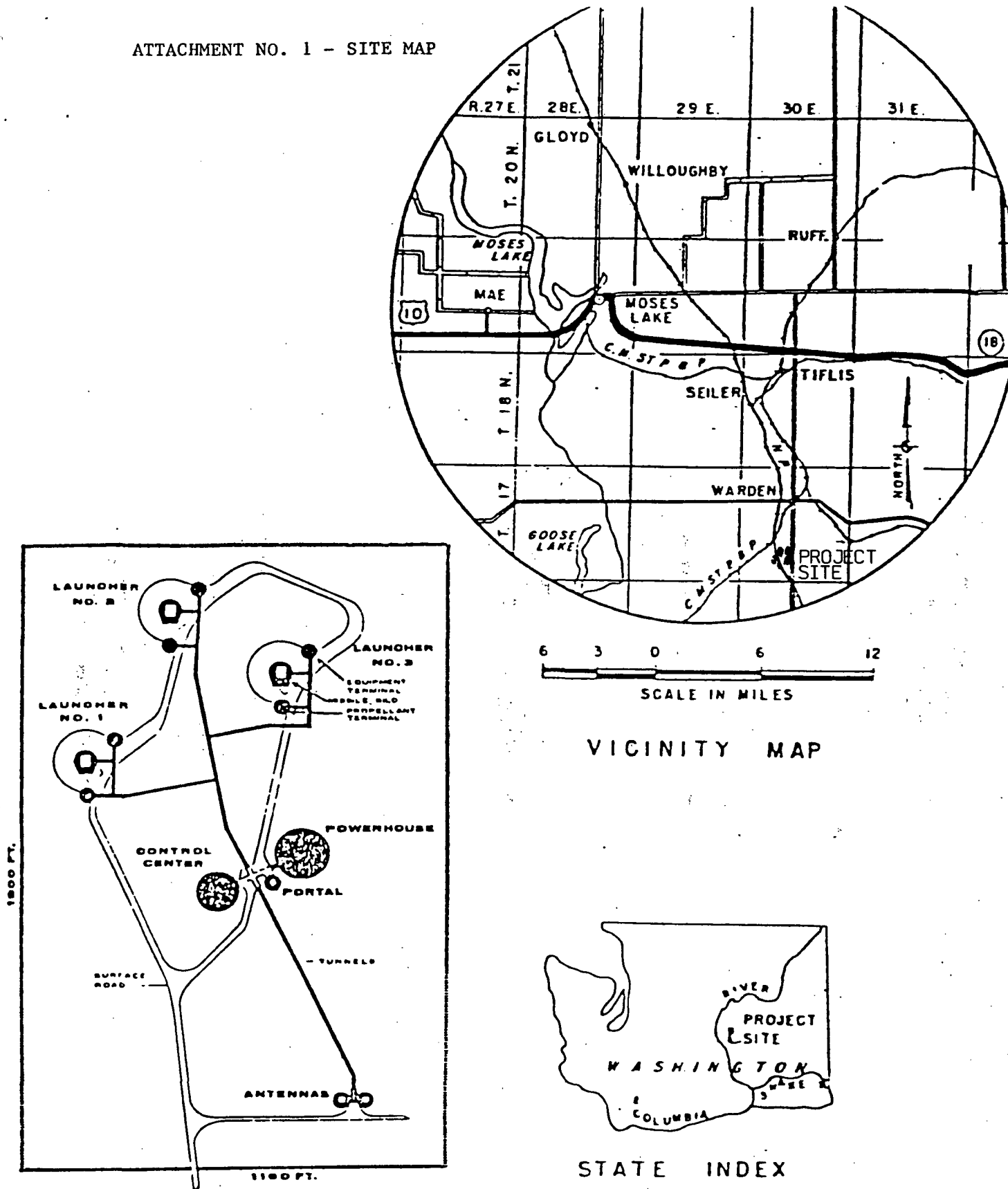


FIG. 1.-TYPICAL LAUNCH COMPLEX

FIOWA035000
 LARSON AFB AF TITAN MISSILE FACILITY S-2
 WARDEN, GRANT COUNTY, WASHINGTON

DEFENSE ENVIRONMENTAL RESTORATION PROGRAM
FOR FORMERLY USED DEFENSE SITES
FINDINGS AND DETERMINATION OF ELIGIBILITY

LARSON AFB TITAN MISSILE FACILITY S-2, WARDEN
GRANT COUNTY, WASHINGTON
SITE NO. F10WA035000

FINDINGS OF FACT

1. The property was acquired between 1959 and 1961 for the Department of the Air Force, Strategic Air Command, for a Titan Intercontinental Ballistic Missile (ICBM) launch site. A total of 295.94 acres was acquired by negotiated purchase or donation, as follows: 52.58 acres fee; 1.53 acres perpetual easement for road access 1.53 acres temporary easement and right-of-way for access road; one no-area license for access road approach; and 241.83 acres perpetual restrictive easement.

2. The Air Force constructed a "hard" launch facility with an underground complex consisting of three missile launch complexes, each with three missile silos, propellant and equipment terminals, two radar antenna silos, air intake and exhaust structures, powerhouse, control center, access portal, and an interconnecting steel tunnel system. There were also several underground storage tanks (USTs) including a 24,500 gallon liquid gas storage tank, a 3,500 gallon sulphuric acid tank, two 67,000 gallon diesel fuel tanks, one 40,000 gallon RP-1 (kerosene) fuel storage tank, three 26,000 gallon liquid oxygen storage tanks and nine clusters of high pressure tanks containing helium and nitrogen.

3. In 1966, all property interests were declared excess and the General Services Administration (GSA) subsequently conveyed the 52.58 acres fee, the 1.53 acres perpetual easement, and the no-area license to Underground Storage, Inc. by quitclaim deed (QCD) executed 5 October 1967. The QCD identifies the former use of the property (missile site) and contains a covenant whereby the grantee agrees to indemnify and save harmless the USA against any and all claims arising out of its use of the property. The 1.53 acres temporary easement terminated 30 November 1961. In 1966, the 241.83 acres perpetual restrictive easement were reported excess and subsequently released by GSA to the fee owners by Release of Easement executed 29 October 1969.


Larson AFB Titan Missile Facility S-2, Warden

F10WA035000

DETERMINATION

Based on the foregoing findings of fact, this site has been determined to be formerly used by the Department of Defense. It is therefore eligible for the Defense Environmental Restoration Program - Formerly Used Defense Sites, established under 10 USC 2701 et seq.

19 Nov 92
Date


ERNEST J. HARRELL
Major General, USA
Commanding

G

Larson AFB Titan Missile Facility S-2 Warden, WA

Quality Assurance Project Plan

by
Guy Barrett
August 16, 1999

Washington State Department of Ecology
Toxics Cleanup Program
Site Cleanup and UST Section

Conducted for the Department of Ecology

Approvals:

Cliff Kirchmer Cliff J. Kirchmer
Quality Assurance Officer 11/16/99

Stuart Magoon [Signature]
Acting Lab Director, Manchester Laboratory

Guy Barrett Guy Barrett
Project Lead

Project No. or Name Larson S-2
Element or Section No. _____
Revision No. 0
Revision Date _____
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Project Description

Historical Information/Site Description

The Larson AFB Titan Missile Facility S-2, located in Warden, Washington was formerly used by the Air Force between 1962 and 1966 as a Titan I ICBM facility (Figure 1). Aboveground structures consisted of a gatehouse, entry portal, air intake and exhaust structures, sewage stabilization pond, spray pond, and security fencing. Subterranean structures included a "hard" launch facility, with three missile launch complexes, each with three vertical missile silos, propellant and equipment terminals, two radar antennae silos, air intake and exhaust structures, control center, powerhouse, access portal, and an interconnecting steel tunnel system. Two deep wells, one 981 feet and one 1000 feet, supplied the water for the two 30,000 gallon underground water tanks which serviced the facility.

Various hazardous, flammable and/or explosive materials were used, stored and disposed of on-site during the period of operation of the facility. These included diesel oil, RP-1 fuel (kerosene), lubrication oil, hydraulic fluid, solvents, de-greasers, transformer fluids (PCB's), nickel-cadmium batteries, liquid oxygen, nitrogen and helium. In most cases, these substances were held in tanks housed inside the facility or buried adjacent to it. Storage capacities indicate the following volumes of selected substances were present routinely at the site; 40,000 gallons of RP-1; 134,000 gallons of diesel oil; 78,000 gallons of liquid oxygen; 3500 gallons of sulphuric acid, and nine clusters of high pressure tanks containing helium and nitrogen.

Chlorinated solvents may have been used in the missile and propellant silos, power house dome, and released into the sanitary drain system via sump pumping. Diesel fuel and kerosene used in the silos and power house were discharged to drain fields and ditch areas. Metals may exist at the site due to impurities in fuel, machinery, lead-based paint, or waste oils. PCB's may be present due to paints, transformers, and hydraulic fluid releases. The site was declared excess in 1966 and salvage operations removed most of the equipment and supplies. In 1970 the silos were used for liquid manure and chemical fertilizer storage, which is how they are used today. A methanol fuel plant was constructed and abandoned after short usage. The facility now stands vacant and unused.

Ecology has not been notified of environmental concerns at this site, but based on investigative results from similar sites, an initial investigation is warranted. Ecology will contact the

Project No. or Name Larson S-2
Element or Section No. _____
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Revision Date _____
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current owner of this property seeking access. A preliminary site visit will not be performed, rather on September 13, 1999 field investigation of this site will commence.

Objectives

The primary objective of this study is to investigate the possible presence of hazardous substances resulting from past practices by the Department of Defense. Soil and water sampling will be conducted at the FUDS Larson AFB Titan Missile Facility S-2 to determine whether residual soil or water contamination is present above Washington State Model Toxics Control Act (MTCA) Cleanup Levels, Chapter 173-340 WAC. This investigation will be used to either confirm or deny the No Further Action (NoFA) required determination made by the Seattle District, Corps of Engineers.

Study Design

At specific locations on the property with the most likely potential for contamination to be present, shallow soil samples will be taken. Ecology anticipates that shallow soil samples will be obtained at the former power house, control center, and launchers as these areas represent the most likely source of spills, leaks, and other release of hazardous materials into the environment. While in the field, if it appears necessary to investigate the subsurface, a hand auger or corer will be used to collect subsurface soil samples. This subsurface sampling will most likely be done in the launcher drain fields, since a 1999 investigation by Hart Crowser, Inc. for the U.S. Army Corps of Engineers at a similar site, Larson Titan S-1, found evidence of volatiles using a soil gas technique at various depths in that area of the site (Figure 2). Actual sample locations will be similar to those at Larson Titan S-1. Additional or different sampling locations may be selected during field work based on visual or other additional information. Soil samples will be collected and analyzed for volatile organics (specific compound of interest are trichloroethylene and perchloroethylene), total petroleum hydrocarbons (diesel and oil range), metals (lead, nickel, cadmium, and arsenic), and PCB's. If sampling of silo water is available, Ecology will collect silo water samples and analyze these for lead and PCB's. Tank sump water will be analyzed for metals and, if available, a

groundwater sample will be taken from the onsite well and analyzed for volatiles. Samples will be collected after first obtaining property access from the current owner.

Project No. or Name Larson S-2
 Element or Section No. _____
 Revision No. 0
 Revision Date _____
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Schedule

This project is scheduled for approximately a four month period. Project milestones and projected dates of completion are listed below. At the end of four months, all data will be evaluated and summarized in a technical report. Any need for additional work will be evaluated at that time.

<u>Milestone</u>	<u>Date</u>
QAPP Approved	July 1999
Soil Sampling	August 1999
Final Report	October 1999

Budget

The estimated laboratory budget for this project is \$3,227 based on analysis of nineteen soil samples (including one field duplicate) and seven water samples (including one field duplicate).

Laboratory Cost Estimate

	<u>Matrix</u>	<u>#</u> <u>Samples</u>	<u>Cost</u>	<u>Subtotal</u>
<i>Metals</i>	(soil) *	7	\$124	\$868
	(water)	2	\$41	\$82
<i>TPH</i>	(soil)	7	\$112	\$784
	(water)	1	\$102	\$102
<i>VOC's</i>	(soil)	5	\$169	\$845
	(water) *	3	\$156	\$468
<i>PCB's</i>	(water)	1	\$178	\$178
	Total			\$3,227

* includes field duplicate

Project No. or Name Larsen S-2
Element or Section No. _____
Revision No. 0
Revision Date _____
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Project Organization

The project will be organized with key personnel performing the following functions:

The project was requested by *Guy Barrett* of the Toxics Cleanup Program (HQ). He will be the project lead and will assist with project design, review of all documents, notification of all landowners of our activities, and preparation of a technical report summarizing any significant findings. His phone number is 360-407-7244.

Carol Johnston will be responsible for sample collection, data gathering and evaluation, and field reports. She can be reached at (360) 407-7242.

Karin Feddersen, Analytical Management Unit Leader, will assist as laboratory contact. Her phone number is (360) 871-8829.

Stuart Magoon, Acting Laboratory Director, will assist as laboratory contact. His phone number is (360) 871-8813.

Data Quality Objectives

Precision, Bias, and Required Detection Limits

Data quality objectives are quantitative and qualitative statements specified to ensure that data of known and appropriate quality are obtained during the soil sampling activities to support the selection of appropriate remedial actions. The precision and bias routinely obtained with the methods selected will be adequate for the purposes of this project. The Method Detection Limit (MDL) is the minimum concentration of a substance that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte. The required detection levels are specified by the MTCA Cleanup Levels (CULs), which are listed in the table on Page 8.

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Element or Section No.	_____
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Representativeness

Representativeness measures how closely the measured results reflect the actual concentration or distribution of the chemical compounds in the matrix sampled. This program will use the results of all analyses to evaluate the data in terms of its intended use. Site locations for sampling are placed using a biased approach to maximize the likelihood of locating and identifying site contamination, if present.

Samples will be packed carefully to minimize the chance of damage or loss. In the event that a sample is damaged during transit or testing, a new sample will be collected and submitted for analysis. The laboratory should notify the project lead as soon as possible when a sample is unsuitable.

Accuracy

Accuracy measures the average or systematic error of an analytical method. This measure is defined as the difference between the average reported values and the actual value. Accuracy will be validated as the Quality Control (QC) Limits of the target analyte in the spiked sample. Accuracy requirements are expressed as QC Limits in the table under the section titled "Analytical Procedures".

Metals - DQO of 10% max. bias, 5% max. Relative Standard Deviation (RSD)

Volatile Organics - DQO of 15% max. bias, 7.5% max. RSD

Diesel - DQO of 25% max. bias, 12.5% max. RSD

PCBs - DQO of 10% max. bias, 30% max. RSD

Comparability

Soil sample results will be compared to cleanup levels established under the Model Toxics Control Act, (MTCA) Chapter 70.105D RCW as noted below in the section titled Analytical Procedures. Methods used at Manchester Laboratory are adequate for this study (Manchester Environmental Laboratory, 1994).

Sampling Procedures

A total of approximately 19 surface/near surface soil samples (7 metals, 7 NWTPH-Dx, 5 VOCs) will be collected from at least three locations - the power house, control center, and

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launch areas. Additional locations may be identified in the field. Sample collection and analysis methods have been selected to provide data of sufficient quality for the above project objectives.

Surface soil samples will be obtained by using a clean scoop, obtaining soil from 0 to 2 inch depth, and placing grab samples directly in pre-cleaned jars from the Manchester Laboratory. All sampling equipment which is not disposable or dedicated will be decontaminated by scrubbing with an Alconox solution and rinsing with distilled, deionized water prior to reuse. Subsurface soil samples will be obtained at depths between 0.0 to 1.5 feet using a 2-inch diameter stainless steel hand auger or coring device. Upon sample collection and proper labeling, all samples will be stored in an ice-filled cooler. Chain-of-custody procedures will be followed according to Manchester Environmental Laboratory protocol (Ecology, 1994).

Approximately 7 well and elevator shaft water samples (1 TPH-Dx, 3 VOC's, 1 PCB, 2 lead only) will be obtained by dedicated disposable bailers or directly from the faucet in the case of the drinking water well. A trip blank consisting of organic-free distilled, deionized water in a sealed 40 ml vial prepared by Manchester Laboratory, will accompany all water samples designated for volatiles analysis.

Samples will be transported to the Ecology headquarters building in Lacey. Samples will be kept in the walk-in cooler until picked up by the laboratory courier to Ecology/EPA Manchester Environmental Laboratory in Manchester, Washington.

Analytical Procedures

Soil samples will be analyzed for total petroleum hydrocarbons using NWTPH-Dx. Nickel, cadmium, lead and arsenic metals will be analyzed using EPA Method 6010, and TCE and PCE will be analyzed using EPA Method 8260B. Low detection limits obtained with these analytical methods are necessary for this project to meet Model Toxics Control Act (MTCA) requirements.

Project No. or Name Larson S-2
 Element or Section No. _____
 Revision No. 0
 Revision Date _____
 Section/Element Page 9 of 10

<u>Compound</u>	<u>Matrix</u>	<u>MTCA CUL</u>	<u>QC</u> <u>Limits</u>	<u>MDL</u>	<u>Method Reference</u>
PCBs	water	0.1 ug/L	**30- 150%	0.1-1 ug/L	EPA Method 8082
Total Metals	soil	As - 20 mg/kg	80- 120%*	2.0 mg/kg	EPA Method 6010B
		Ni - 1600 mg/kg	80- 120%*	1.5 mg/kg	EPA Method 6010B
		Cd - 2.0 mg/kg	80- 120%*	0.5 mg/kg	EPA Method 6010B
		Pb - 250 mg/kg	80- 120%*	3.0 mg/kg	EPA Method 6010B
	water	Pb - 5.0 ug/L	75- 125%*	2.0 ug/L	EPA Method 6020
TPH	soil	200 mg/kg	**50- 150%	diesel - 25 mg/kg	NWTPH-Dx
			**50- 150%	oil - 100 mg/kg	
TCE	soil	500 ug/kg	70- 130%*	5-20 ug/kg	EPA Method 8260B
	water	5.0 ug/L	70- 130%*	1-5 ug/L	
PCE	soil	500 ug/kg	70- 130%*	5-20 ug/kg	EPA Method 8260B
	water	5.0 ug/L	70- 130%*	1-5 ug/L	

* Recovery for LCS

** Recovery for Surrogate

Project No. or Name Larson S-2
Element or Section No. _____
Revision No. 0
Revision Date _____
Section/Element Page 9 of 10

Quality Control Procedures

Field

Field quality control samples will consist of a field duplicate for each of the sampled matrices. A duplicate soil sample will be collected by obtaining a surface soil sample as close as possible to one of the sample locations. One field duplicate sample will be collected for every 10 soil samples.

These samples will be submitted to the laboratory with a different identification. The purpose of the samples is to estimate total variability in the results.

Laboratory

Routine laboratory quality control procedures will be adequate to estimate laboratory precision and bias for this project. Laboratory quality control tests consist of blanks, replicates, matrix spikes and check standards, which are done on each set of 20 or fewer samples.

Precision will be estimated from the results of replicate analyses of check standards, matrix spikes and field duplicate samples. Results of analyses of check standards and matrix spikes will be used as indicators of bias due to calibration of matrix effects, respectively. Analytical duplicates and matrix spikes should be prepared from these samples.

Project No. or Name Larson S-2
Element or Section No. _____
Revision No. 0
Revision Date _____
Section/Element Page 10 of 10

Data Reduction, Review and Reporting

Laboratory

All laboratory data generated by Manchester Environmental Laboratory will be managed by the Laboratory Information Management System (LIMS) and reported in electronic format (ASCII) files to the project lead. Laboratory data generated at contract laboratories will undergo a quality assurance review by Manchester Laboratory staff. Contract laboratory data will be transmitted to the project lead in paper format.

Project

A technical report will be prepared at the completion of all sampling summarizing any significant findings.

References

Manchester Environmental Laboratory, 1994. Lab User's Manual. Washington State Department of Ecology, Revised January 1994.

Toxics Investigations Section, 1994. Quality Assurance Project Plan Guidance. Washington State Department of Ecology, Environmental Investigations and Laboratory Services Program, October 1994.

Quality Assurance Section, 1991. Guidelines and Specifications for Preparing Quality Assurance Project Plans. Environmental Investigations and Laboratory Services Program, May 1991.

Larson AFB Titan Missile Facility S-2 Inventory Project Report (INPR), Department of the Army, November 19, 1992.

H

Manchester Environmental Laboratory

7411 Beach Dr E, Port Orchard Washington 98366

CASE NARRATIVE

December 3, 1999

Subject: FUDS Larson Titan S-2 Project

Sample(s): 99468131, 33, 35, 37, 38, 40 and 42

Officer(s): Guy Barrett

By: Bob Carrell *BC*
Organics Analysis Unit

NWTPH-Dx ANALYSES

ANALYTICAL METHODS:

These soil samples were extracted following Manchester Laboratory's standard operating procedure for the extraction of samples for analysis using the NWTPH-Dx method. To aid in the removal of biogenic interferences, these extracts were sequentially treated with concentrated sulfuric acid and silica gel prior to analysis as outlined in the NWTPH-Dx method.

All analytes have a respective practical quantitation limit (PQL) that is higher than the corresponding method detection limit (MDL). If a petroleum product is detected and its identification is unambiguously confirmed at a concentration below its PQL, the reported concentration is qualified as an estimate using the "J" qualifier.

HOLDING TIMES:

All samples were extracted and analyzed within the method holding times.

BLANKS:

No petroleum products were detected at or above the practical quantitation limits (PQL) for this method, thus demonstrating that the system was free from contamination.

SURROGATES:

Although lower than we generally see them, the pentacosane surrogate recoveries were acceptable, ranging from 57% to 93%.

COMMENTS:

The only petroleum product observed in any of these samples was a lube oil, which basically consists of an unresolved envelope of compounds. Chromatograms of this nature could represent hydraulic fluids, transformer oils or lubricating oils and, with the limited ability to distinguish between them, the result is the use of the generic term "lube oil" when dealing with any of them. Sample 99468138 is being reported with a PQL which is approximately three times that reported for the other samples but which is still well under the MTCA cleanup level. The reason for this was that there appears to be laboratory contamination from a poorly pre-cleaned Soxhlet thimble used in the extraction, which could provide a false picture of a potential problem at this site. Those samples which are being reported with positive hits for lube oil, do not appear to contain the material observed in sample 99468138 and can be assumed to contain the petroleum product and levels stated.

The data is useable as qualified.

DATA QUALIFIER CODES

- U - The analyte was not detected at or above the reported result.
- J - The analyte was positively identified. The associated numerical result is an estimate.
- UJ - The analyte was not detected at or above the reported estimated result.
- REJ - The data are unusable for all purposes.
- NAF - Not analyzed for.
- N - For organic analytes there is evidence the analyte is present in this sample.
- NJ - There is evidence that the analyte is present. The associated numerical Result is an estimate.
- NC - Not Calculated
- E - This qualifier is used when the concentration of the associated value exceeds the known calibration range.

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Semi-volatile petroleum products

Project Name: FUDS Larson Titan S-2

LIMS Project ID: 2910-99

Lab ID: OBS9334A1

QC Type: Laboratory Method Blank

Project Officer: Guy Barrett

Date Prepared: 11/30/99

Date Analyzed: 12/01/99

Method: NWTPH-DX

Matrix: Sediment/Soil

Units: mg/Kg dw

Analyte	Result	Qualifier
---------	--------	-----------

Lube Oil	18	U
----------	----	---

Surrogate Recoveries

Pentacosane	63	%
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Authorized By: *Barrett*

Release Date: 12-3-99

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Semi-volatile petroleum products

Project Name: FUDS Larson Titan S-2

LIMS Project ID: 2910-99

Lab ID: OBS9334A2

QC Type: Laboratory Method Blank

Project Officer: Guy Barrett

Date Prepared: 11/30/99

Date Analyzed: 12/01/99

Method: NWTPH-DX

Matrix: Sediment/Soil

Units: mg/Kg dw

Analyte	Result	Qualifier
---------	--------	-----------

Lube Oil	18	U
----------	----	---

Surrogate Recoveries

Pentacosane	70	%
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Authorized By: *Barrett*

Release Date: 12-3-99

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Semi-volatile petroleum products

Project Name: FUDS Larson Titan S-2

LIMS Project ID: 2910-99

Sample: 99468131

Date Collected: 11/18/99

Method: NWTPH-DX

Field ID: TITS299A2

Date Prepared: 11/30/99

Matrix: Sediment/Soil

Project Officer: Guy Barrett

Date Analyzed: 12/01/99

Units: mg/Kg dw

Analyte	Result	Qualifier
---------	--------	-----------

Lube Oil	19	U
----------	----	---

Surrogate Recoveries

Pentacosane	58	%
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Authorized By:

Barrett

Release Date:

12-3-99

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Semi-volatile petroleum products

Project Name: FUDS Larson Titan S-2

LIMS Project ID: 2910-99

Sample: 99468131 (Duplicate - LDPI)

Date Collected: 11/18/99

Method: NWTPH-DX

Field ID: TITS299A2

Date Prepared: 11/30/99

Matrix: Sediment/Soil

Project Officer: Guy Barrett

Date Analyzed: 12/01/99

Units: mg/Kg dw

Analyte	Result	Qualifier
---------	--------	-----------

Lube Oil	18	U
----------	----	---

Surrogate Recoveries

Pentacosane	57	%
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Authorized By:

Barrett

Release Date: 12-3-99

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Semi-volatile petroleum products

Project Name: FUDS Larson Titan S-2

LIMS Project ID: 2910-99

Sample: 99468133

Date Collected: 11/18/99

Method: NWTPH-DX

Field ID: TITS299B2

Date Prepared: 11/30/99

Matrix: Sediment/Soil

Project Officer: Guy Barrett

Date Analyzed: 12/01/99

Units: mg/Kg dw

Analyte	Result	Qualifier
---------	--------	-----------

Lube Oil	20	U
----------	----	---

Surrogate Recoveries

Pentacosane	59	%
-------------	----	---

Authorized By:

Barrett

Release Date:

12-3-99

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Semi-volatile petroleum products

Project Name: FUDS Larson Titan S-2

LIMS Project ID: 2910-99

Sample: 99468135

Date Collected: 11/18/99

Method: NWTPH-DX

Field ID: TITS299C2

Date Prepared: 11/30/99

Matrix: Sediment/Soil

Project Officer: Guy Barrett

Date Analyzed: 12/01/99

Units: mg/Kg dw

Analyte	Result	Qualifier
---------	--------	-----------

Lube Oil	120	
----------	-----	--

Surrogate Recoveries

Pentacosane	68	%
-------------	----	---

Authorized By:

Barrett

Release Date:

12-3-99

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Semi-volatile petroleum products

Project Name: FUDS Larson Titan S-2

LIMS Project ID: 2910-99

Sample: 99468137

Date Collected: 11/18/99

Method: NWTPH-DX

Field ID: TITS299D2

Date Prepared: 11/30/99

Matrix: Sediment/Soil

Project Officer: Guy Barrett

Date Analyzed: 12/01/99

Units: mg/Kg dw

Analyte	Result	Qualifier
---------	--------	-----------

Lube Oil	840	
----------	-----	--

Surrogate Recoveries:

Pentacosane	67	%
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Authorized By:

Barrett

Release Date:

12-3-99

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Semi-volatile petroleum products

Project Name: FUDS Larson Titan S-2

LIMS Project ID: 2910-99

Sample: 99468138

Date Collected: 11/18/99

Method: NWTPH-DX

Field ID: TITS299E1

Date Prepared: 11/30/99

Matrix: Sediment/Soil

Project Officer: Guy Barrett

Date Analyzed: 12/01/99

Units: mg/Kg dw

Analyte	Result	Qualifier
---------	--------	-----------

Lube Oil	60	U
----------	----	---

Surrogate Recoveries

Pentacosane	93	%
-------------	----	---

Authorized By: Barrett

Release Date: 12-3-99

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Semi-volatile petroleum products

Project Name: FUDS Larson Titan S-2

LIMS Project ID: 2910-99

Sample: 99468140

Date Collected: 11/18/99

Method: NWTPH-DX

Field ID: TITS299F2

Date Prepared: 11/30/99

Matrix: Sediment/Soil

Project Officer: Guy Barrett

Date Analyzed: 12/01/99

Units: mg/Kg dw

Analyte	Result	Qualifier
---------	--------	-----------

Lube Oil	18	U
----------	----	---

Surrogate Recoveries

Pentacosane	61	%
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Authorized By: Paul

Release Date: 12-3-99

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Semi-volatile petroleum products

Project Name: FUDS Larson Titan S-2

LIMS Project ID: 2910-99

Sample: 99468142

Date Collected: 11/19/99

Method: NWTPH-DX

Field ID: TITS299G2

Date Prepared: 11/30/99

Matrix: Sediment/Soil

Project Officer: Guy Barrett

Date Analyzed: 12/01/99

Units: mg/Kg dw

Analyte	Result	Qualifier
---------	--------	-----------

Lube Oil	24	U
----------	----	---

Surrogate Recoveries

Pentacosane	68	%
-------------	----	---

Authorized By:

Barrett

Release Date:

12-3-99

Page:

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Manchester Environmental Laboratory

7411 Beach Drive E, Port Orchard Washington 98366

December 3, 1999

Subject: **FUDS Larson Titan S-2**
Samples: 989468043
Project ID: 2910-99
Project Officer: Guy Barrett
By: Karin Feddersen *YF*

VOLATILE ORGANIC ANALYSIS

SUMMARY:

The data is usable with the qualifications noted.

ANALYTICAL METHODS:

Volatile organic compounds were analyzed using the Manchester Laboratory modification of the EPA Method 8260 purge-trap procedure and capillary Gas Chromatography with Mass Spectrometer (GC/MS) analysis. Routine QA/QC procedures were performed.

BLANKS:

A small amount of Toluene was detected in the laboratory blank. No Toluene was detected in the sample.

SURROGATES:

Surrogate recoveries were within acceptable limits for all samples.

HOLDING TIMES:

The samples were analyzed within the recommended 14 day holding time.

MATRIX SPIKE AND MATRIX SPIKE DUPLICATE:

Matrix spike recoveries were within acceptable limits with several exceptions, which did not affect the results.

DATA QUALIFIER CODES:

- U - The analyte was not detected at or above the reported value.
- J - The analyte was positively identified. The associated numerical value is an estimate.
- UJ - The analyte was not detected at or above the reported estimated result.
- REJ - The data are unusable for all purposes.
- NAF - Not analyzed for.
- N - There is evidence the analyte is present in the sample.
- NJ - There is evidence that the analyte is present. The associated numerical result is an estimate.
- E - This qualifier is used when the concentration of the associated value exceeds the known calibration range. The associated numerical result is an estimate.
- bold** - The analyte was present in the sample. (Visual Aid to locate detected compounds on report sheet.)

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Volatile Organic Analysis

Project Name: FUDS Larson Titan S-2

LIMS Project ID: 2910-99

Sample: 99468143

Date Collected: 11/19/99

Method: SW8260

Field ID: TITS299G3

Matrix: Sediment/Soil

Project Officer: Guy Barrett

Date Analyzed: 12/02/99

Units: ug/Kg dw

Analyte	Result	Qualifier	Analyte	Result	Qualifier
Dichlorodifluoromethane	5.6	U	Tetrachloroethene	5.6	U
Chloromethane	5.6	U	Dibromochloromethane	5.6	U
Vinyl Chloride	5.6	U	1,2-Dibromoethane (EDB)	5.6	U
Bromomethane	5.6	U	Chlorobenzene	5.6	U
Chloroethane	5.6	U	1,1,1,2-Tetrachloroethane	5.6	U
Trichlorofluoromethane	14	U	Ethylbenzene	5.6	U
Ethyl Ether	5.6	U	m & p-Xylene	11	U
1,1,2 Trichlorotrifluoroethane	5.6	U	o-Xylene	5.6	U
1,1-Dichloroethene	5.6	U	Styrene	56	U
Acetone	28	U	Bromoform	5.6	U
Methyl Iodide	5.6	U	Isopropylbenzene (Cumene)	5.6	U
Carbon Disulfide	11	U	1,1,2,2-Tetrachloroethane	5.6	U
Methylene Chloride	22		Trans-1,4-Dichloro-2-butene	14	U
Methyl t-butyl ether	5.6	U	1,2,3-Trichloropropane	5.6	U
Trans-1,2-Dichloroethene	5.6	U	Bromobenzene	5.6	U
1,1-Dichloroethane	5.6	U	n-Propylbenzene	5.6	U
2-Butanone	11	U	2-Chlorotoluene	5.6	U
Cis-1,2-Dichloroethene	5.6	U	1,3,5-Trimethylbenzene	5.6	U
2,2-Dichloropropane	5.6	U	4-Chlorotoluene	5.6	U
Bromochloromethane	5.6	U	Tert-Butylbenzene	5.6	U
Chloroform	5.6	U	1,2,4-Trimethylbenzene	5.6	U
Tetrahydrofuran	14	U	Pentachloroethane	5.6	U
1,1,1-Trichloroethane	5.6	U	Sec-Butylbenzene	5.6	U
1,1-Dichloropropene	5.6	U	p-Isopropyltoluene	5.6	U
Carbon Tetrachloride	5.6	U	1,3-Dichlorobenzene	5.6	U
1,2-Dichloroethane	5.6	U	1,4-Dichlorobenzene	5.6	U
Benzene	5.6	U	n-Butylbenzene	5.6	U
Trichloroethene	5.6	U	1,2-Dichlorobenzene	5.6	U
1,2-Dichloropropane	5.6	U	Hexachloroethane	5.6	U
Dibromomethane	5.6	U	1,2-Dibromo-3-Chloropropane	14	U
Bromodichloromethane	5.6	U	1,2,4-Trichlorobenzene	14	U
Cis-1,3-Dichloropropene	6	U	Hexachlorobutadiene	5.6	U
4-Methyl-2-Pentanone	5.6	U	Naphthalene	5.6	U
Toluene	5.6	U	1,2,3-Trichlorobenzene	14	U
Trans-1,3-Dichloropropene	5.3	U			
1,1,2-Trichloroethane	5.6	U			
1,3-Dichloropropane	5.6	U			
2-Hexanone	11	U			

Authorized By: 

Release Date: 12/13/99

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Volatile Organic Analysis

Project Name: FUDS Larson Titan S-2

LIMS Project ID: 2910-99

Sample: 99468143

Date Collected: 11/19/99

Method: SW8260

Field ID: TTTS299G3

Matrix: Sediment/Soil

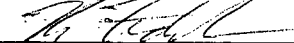
Project Officer: Guy Barrett

Date Analyzed: 12/02/99

Units: ug/Kg dw

Surrogate Recoveries

1,2-Dichloroethane-D4	131	%
1,4-Difluorobenzene	103	%
Toluene-D8	101	%
p-Bromofluorobenzene	87	%
1,2-Dichlorobenzene-D4	116	%

Authorized By: 

Release Date: 12/13/99

Page:

2

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Volatile Organic Analysis

Project Name: FUDS Larson Titan S-2

LIMS Project ID: 2910-99

Sample: 99468143 (Matrix Spike - LMX1) Date Collected: 11/19/99

Method: SW8260

Field ID: TITS299G3

Matrix: Sediment/Soil

Project Officer: Guy Barrett

Date Analyzed: 12/02/99

Units: % Recovery

Analyte	Result	Qualifier	Analyte	Result	Qualifier
Dichlorodifluoromethane	85		Tetrachloroethene	98	
Chloromethane	105		Dibromochloromethane	126	
Vinyl Chloride	107		1,2-Dibromoethane (EDB)	148	
Bromomethane	103		Chlorobenzene	105	
Chloroethane	109		1,1,1,2-Tetrachloroethane	109	
Trichlorofluoromethane	106		Ethylbenzene	103	
Ethyl Ether	160		m & p-Xylene	90	
1,1,2 Trichlorotrifluoroethane	122		o-Xylene	93	
1,1-Dichloroethene	105		Styrene	94	
Acetone	199		Bromoform	157	
Methyl Iodide	98		Isopropylbenzene (Cumene)	103	
Carbon Disulfide	106		1,1,2,2-Tetrachloroethane	173	
Methylene Chloride	147		Trans-1,4-Dichloro-2-butene	165	
Methyl t-butyl ether	184		1,2,3-Trichloropropane	202	
Trans-1,2-Dichloroethene	104		Bromobenzene	101	
1,1-Dichloroethane	115		n-Propylbenzene	93	
2-Butanone	162		2-Chlorotoluene	92	
Cis-1,2-Dichloroethene	112		1,3,5-Trimethylbenzene	97	
2,2-Dichloropropane	110		4-Chlorotoluene	89	
Bromochloromethane	145		Tert-Butylbenzene	107	
Chloroform	125		1,2,4-Trimethylbenzene	91	
Tetrahydrofuran	226		Pentachloroethane	105	
1,1,1-Trichloroethane	114		Sec-Butylbenzene	100	
1,1-Dichloropropene	106		p-Isopropyltoluene	91	
Carbon Tetrachloride	99		1,3-Dichlorobenzene	90	
1,2-Dichloroethane	148		1,4-Dichlorobenzene	89	
Benzene	106		n-Butylbenzene	85	
Trichloroethene	133		1,2-Dichlorobenzene	98	
1,2-Dichloropropane	112		Hexachloroethane	102	
Dibromomethane	148		1,2-Dibromo-3-Chloropropane	165	
Bromodichloromethane	119		1,2,4-Trichlorobenzene	89	
Cis-1,3-Dichloropropene	112		Hexachlorobutadiene	78	
4-Methyl-2-Pentanone	185		Naphthalene	108	
Toluene	98		1,2,3-Trichlorobenzene	92	
Trans-1,3-Dichloropropene	112				
1,1,2-Trichloroethane	142				
1,3-Dichloropropane	146				
2-Hexanone	116				

Authorized By: 

Release Date: 12/13/99

Page:

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Volatile Organic Analysis

Project Name: FUDS Larson Titan S-2

LIMS Project ID: 2910-99

Sample: 99468143 (Matrix Spike - LMX1) **Date Collected:** 11/19/99

Method: SW8260

Field ID: TITS299G3

Matrix: Sediment/Soil

Project Officer: Guy Barrett

Date Analyzed: 12/02/99

Units: % Recovery

Surrogate Recoveries

1,2-Dichloroethane-D4	124	%
1,4-Difluorobenzene	102	%
Toluene-D8	98	%
p-Bromofluorobenzene	106	%
1,2-Dichlorobenzene-D4	99	%

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Volatile Organic Analysis

Project Name: FUDS Larson Titan S-2

LIMS Project ID: 2910-99

Sample: 99468143 (Matrix Spike - LMX2) Date Collected: 11/19/99

Method: SW8260

Field ID: TITS299G3


Matrix: Sediment/Soil

Project Officer: Guy Barrett

Date Analyzed: 12/02/99

Units: % Recovery

Analyte	Result	Qualifier	Analyte	Result	Qualifier
Dichlorodifluoromethane	77		Tetrachloroethene	107	
Chloromethane	100		Dibromochloromethane	123	
Vinyl Chloride	103		1,2-Dibromoethane (EDB)	141	
Bromomethane	94		Chlorobenzene	97	
Chloroethane	101		1,1,1,2-Tetrachloroethane	105	
Trichlorofluoromethane	99		Ethylbenzene	99	
Ethyl Ether	142		m & p-Xylene	87	
1,1,2 Trichlorotrifluoroethane	116		o-Xylene	90	
1,1-Dichloroethene	98		Styrene	86	
Acetone	141		Bromoform	151	
Methyl Iodide	91		Isopropylbenzene (Cumene)	96	
Carbon Disulfide	100		1,1,2,2-Tetrachloroethane	155	
Methylene Chloride	131		Trans-1,4-Dichloro-2-butene	155	
Methyl t-butyl ether	139		1,2,3-Trichloropropane	199	
Trans-1,2-Dichloroethene	99		Bromobenzene	99	
1,1-Dichloroethane	110		n-Propylbenzene	91	
2-Butanone	145		2-Chlorotoluene	88	
Cis-1,2-Dichloroethene	110		1,3,5-Trimethylbenzene	94	
2,2-Dichloropropane	103		4-Chlorotoluene	84	
Bromochloromethane	143		Tert-Butylbenzene	97	
Chloroform	114		1,2,4-Trimethylbenzene	86	
Tetrahydrofuran	208		Pentachloroethane	104	
1,1,1-Trichloroethane	112		Sec-Butylbenzene	95	
1,1-Dichloropropene	101		p-Isopropyltoluene	82	
Carbon Tetrachloride	97		1,3-Dichlorobenzene	85	
1,2-Dichloroethane	146		1,4-Dichlorobenzene	90	
Benzene	99		n-Butylbenzene	77	
Trichloroethene	131		1,2-Dichlorobenzene	91	
1,2-Dichloropropane	109		Hexachloroethane	91	
Dibromomethane	149		1,2-Dibromo-3-Chloropropane	150	
Bromodichloromethane	115		1,2,4-Trichlorobenzene	67	
Cis-1,3-Dichloropropene	109		Hexachlorobutadiene	63	
4-Methyl-2-Pentanone	166		Naphthalene	84	
Toluene	92		1,2,3-Trichlorobenzene	67	
Trans-1,3-Dichloropropene	104				
1,1,2-Trichloroethane	136				
1,3-Dichloropropane	143				
2-Hexanone	76				

Authorized By: 

Release Date: 12/13/99

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Volatile Organic Analysis

Project Name: FUDS Larson Titan S-2

LIMS Project ID: 2910-99

Sample: 99468143 (Matrix Spike - LMX2) Date Collected: 11/19/99

Method: SW8260

Field ID: TITS299G3

Matrix: Sediment/Soil

Project Officer: Guy Barrett

Date Analyzed: 12/02/99

Units: % Recovery

Surrogate Recoveries

1,2-Dichloroethane-D4	126	%
1,4-Difluorobenzene	101	%
Toluene-D8	97	%
p-Bromofluorobenzene	106	%
1,2-Dichlorobenzene-D4	104	%

Authorized By: 

Release Date: 12/13/99

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Volatile Organic Analysis

Project Name: FUDS Larson Titan S-2

LIMS Project ID: 2910-99

Lab ID: ODBS9336

Method: SW8260

QC Type: Laboratory Method Blank

Matrix: Sediment/Soil

Project Officer: Guy Barrett

Date Analyzed: 12/02/99

Units: ug/Kg dw

Analyte	Result	Qualifier	Analyte	Result	Qualifier
Dichlorodifluoromethane	5.6	U	Tetrachloroethene	5.6	U
Chloromethane	5.6	U	Dibromochloromethane	5.6	U
Vinyl Chloride	5.6	U	1,2-Dibromoethane (EDB)	5.6	U
Bromomethane	5.6	U	Chlorobenzene	5.6	U
Chloroethane	5.6	U	1,1,1,2-Tetrachloroethane	5.6	U
Trichlorofluoromethane	14	U	Ethylbenzene	5.6	U
Ethyl Ether	5.6	U	m & p-Xylene	11	U
1,1,2 Trichlorotrifluoroethane	5.6	U	o-Xylene	5.6	U
1,1-Dichloroethene	5.6	U	Styrene	56	U
Acetone	28	U	Bromoform	5.6	U
Methyl Iodide	5.6	U	Isopropylbenzene (Cumene)	5.6	U
Carbon Disulfide	11	U	1,1,2,2-Tetrachloroethane	5.6	U
Methylene Chloride	5.6	U	Trans-1,4-Dichloro-2-butene	14	U
Methyl t-butyl ether	5.6	U	1,2,3-Trichloropropane	5.6	U
Trans-1,2-Dichloroethene	5.6	U	Bromobenzene	5.6	U
1,1-Dichloroethane	5.6	U	n-Propylbenzene	5.6	U
2-Butanone	11	U	2-Chlorotoluene	5.6	U
Cis-1,2-Dichloroethene	5.6	U	1,3,5-Trimethylbenzene	5.6	U
2,2-Dichloropropane	5.6	U	4-Chlorotoluene	5.6	U
Bromochloromethane	5.6	U	Tert-Butylbenzene	5.6	U
Chloroform	5.6	U	1,2,4-Trimethylbenzene	5.6	U
Tetrahydrofuran	14	U	Pentachloroethane	5.6	U
1,1,1-Trichloroethane	5.6	U	Sec-Butylbenzene	5.6	U
1,1-Dichloropropene	5.6	U	p-Isopropyltoluene	5.6	U
Carbon Tetrachloride	5.6	U	1,3-Dichlorobenzene	5.6	U
1,2-Dichloroethane	5.6	U	1,4-Dichlorobenzene	5.6	U
Benzene	5.6	U	n-Butylbenzene	5.6	U
Trichloroethene	5.6	U	1,2-Dichlorobenzene	5.6	U
1,2-Dichloropropane	5.6	U	Hexachloroethane	5.6	U
Dibromomethane	5.6	U	1,2-Dibromo-3-Chloropropane	14	U
Bromodichloromethane	5.6	U	1,2,4-Trichlorobenzene	14	U
Cis-1,3-Dichloropropene	6	U	Hexachlorobutadiene	5.6	U
4-Methyl-2-Pentanone	5.6	U	Naphthalene	5.6	U
Toluene	1.7	J	1,2,3-Trichlorobenzene	14	U
Trans-1,3-Dichloropropene	5.3	U			
1,1,2-Trichloroethane	5.6	U			
1,3-Dichloropropane	5.6	U			
2-Hexanone	11	U			

Authorized By: 

Release Date: 12/13/99

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Volatile Organic Analysis

Project Name: FUDS Larson Titan S-2

LIMS Project ID: 2910-99

Lab ID: ODBS9336

Method: SW8260

QC Type: Laboratory Method Blank

Matrix: Sediment/Soil

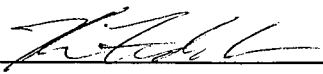
Project Officer: Guy Barrett

Date Analyzed: 12/02/99

Units: ug/Kg dw

Surrogate Recoveries

1,2-Dichloroethane-D4	103	%
1,4-Difluorobenzene	103	%
Toluene-D8	104	%
p-Bromofluorobenzene	86	%
1,2-Dichlorobenzene-D4	100	%

Authorized By: 

Release Date: 12/13/99

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Washington Department of Ecology
Manchester Environmental Laboratory
7411 Beach Drive East
Port Orchard, WA 98366

December 17, 1999

TO: Guy Barrett
FROM: Jim Ross, Manchester Lab *MR*
SUBJECT: Metals Quality Assurance memo for the FUDS Larson Titan S-2 monitoring

SUMMARY

Antimony data is qualified as estimated due to low LCS and spike recoveries. All other data for this project met all quality assurance and quality control criteria and can be used without qualification.

SAMPLE RECEIPT

The samples were received by the Manchester Laboratory on 11/22/99

HOLDING TIMES

All analyses were performed within the specified holding time (28 days for Mercury, 180 days all other metals).

INSTRUMENT CALIBRATION

Instrument calibration was performed before each analytical run and checked by initial calibration verification standards and blanks. Continuing calibration standards and blanks were analyzed at a frequency of 10% during the run and again at the end of the analytical run. All initial and continuing calibration verification standards and blanks were within the relevant control limits.

PROCEDURAL BLANKS

Requested analytes were not detected above reporting limits.

SPIKED SAMPLE ANALYSES

Antimony recovery was low on both the spike and duplicate spike samples. All other spike recoveries were within QC acceptance criteria (75-125 %).

PRECISION DATA

Precision estimates based on duplicate spike analysis were all within acceptance criteria ($\pm 20\%$).

LABORATORY CONTROL SAMPLE (LCS) ANALYSES

Antimony recovery was low for this sample set. All other LCS recoveries were within the acceptance criteria for the individual analytes.

Please call Jim Ross at (360) 871-8808 to further discuss this project.

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name: FUDS Larson Titan S-2

LIMS Project ID: 2910-99

Lab ID: M9337SB1

QC Type: Laboratory Method Blank

Project Officer: Guy Barrett

Date Prepared: 12/03/99

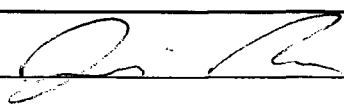
Date Analyzed: 12/07/99

Method: SW6010

Matrix: Sediment/Soil

Units: mg/Kg dw

Analyte	Result	Qualifier
Antimony	5	U
Beryllium	0.1	U
Cadmium	0.5	U
Chromium	1	U
Copper	1	U
Nickel	2	U
Silver	2	U
Zinc	0.5	U

Authorized By: 

Release Date: 12/16/99

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name: FUDS Larson Titan S-2

LIMS Project ID: 2910-99

Lab ID: M9337SL1

QC Type: ERA Solid Reference Material

Date Prepared: 12/03/99

Method: SW6010

Project Officer: Guy Barrett

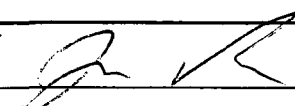
Date Analyzed: 12/07/99

Matrix: Sediment/Soil

Units: mg/Kg dw

Analyte	Result	Qualifier
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Antimony	32	
Beryllium	112	
Cadmium	109	
Chromium	106	
Copper	105	
Nickel	103	
Silver	107	
Zinc	95	

Authorized By: 

Release Date: 12/16/99

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name: FUDS Larson Titan S-2

LIMS Project ID: 2910-99

Sample: 99468130

Date Collected: 11/18/99

Method: SW6010

Field ID: TITS299A1

Date Prepared: 12/03/99

Matrix: Sediment/Soil

Project Officer: Guy Barrett

Date Analyzed: 12/07/99

Units: mg/Kg dw

Analyte	Result	Qualifier
Antimony	5	UJ
Beryllium	0.92	
Cadmium	0.91	U
Chromium	8.8	
Copper	10.0	
Nickel	9.2	
Silver	2	U
Zinc	22.0	

Authorized By: 

Release Date: 12/16/99

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for Inductively Coupled Plasma

Project Name: FUDS Larson Titan S-2

LIMS Project ID: 2910-99

Sample: 99468132

Date Collected: 11/18/99

Method: SW6010

Field ID: TITS299B1

Date Prepared: 12/03/99

Matrix: Sediment/Soil

Project Officer: Guy Barrett

Date Analyzed: 12/07/99

Units: mg/Kg dw

Analyte	Result	Qualifier
Antimony	5	UJ
Beryllium	1.91	
Cadmium	1.53	
Chromium	10.4	
Copper	17.2	
Nickel	11	
Silver	2	U
Zinc	39.2	

Authorized By: 

Release Date: 12/14/99

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for Inductively Coupled Plasma

Project Name: FUDS Larson Titan S-2

LIMS Project ID: 2910-99

Sample: 99468134

Date Collected: 11/18/99

Method: SW6010

Field ID: TITS299C1

Date Prepared: 12/03/99

Matrix: Sediment/Soil

Project Officer: Guy Barrett

Date Analyzed: 12/07/99

Units: mg/Kg dw

Analyte	Result	Qualifier
Antimony	5	UJ
Beryllium	1.55	
Cadmium	1.22	
Chromium	10.7	
Copper	18.1	
Nickel	10.7	
Silver	2	U
Zinc	36.7	

Authorized By: 

Release Date: 12/16/99

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for Inductively Coupled Plasma

Project Name: FUDS Larson Titan S-2

LIMS Project ID: 2910-99

Sample: 99468136

Date Collected: 11/18/99

Method: SW6010

Field ID: TITS299D1

Date Prepared: 12/03/99

Matrix: Sediment/Soil

Project Officer: Guy Barrett

Date Analyzed: 12/07/99

Units: mg/Kg dw

Analyte	Result	Qualifier
Antimony	5	UJ
Beryllium	1.05	
Cadmium	1.14	
Chromium	39.3	
Copper	110	
Nickel	22.5	
Silver	2	U
Zinc	56.8	

Authorized By: 

Release Date: 12/12/99

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name: FUDS Larson Titan S-2

LIMS Project ID: 2910-99

Sample: 99468139

Date Collected: 11/18/99

Method: SW6010

Field ID: TITS299F1

Date Prepared: 12/03/99

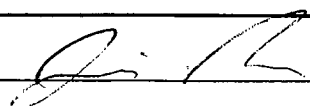
Matrix: Sediment/Soil

Project Officer: Guy Barrett

Date Analyzed: 12/07/99

Units: mg/Kg dw

Analyte	Result	Qualifier
Antimony	5	UJ
Beryllium	1.55	
Cadmium	1.64	
Chromium	10.1	
Copper	16.5	
Nickel	10	
Silver	2	U
Zinc	35.1	

Authorized By: 

Release Date: 12/16/99

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for Inductively Coupled Plasma

Project Name: FUDS Larson Titan S-2

LIMS Project ID: 2910-99

Sample: 99468139 (Matrix Spike - LMX1) Date Collected: 11/18/99

Method: SW6010

Field ID: TITS299F1

Date Prepared: 12/03/99

Matrix: Sediment/Soil

Project Officer: Guy Barrett

Date Analyzed: 12/07/99

Units: % Recovery

Analyte	Result	Qualifier
Antimony	23	
Beryllium	99	
Cadmium	96	
Chromium	97	
Copper	98	
Nickel	99	
Silver	91	
Zinc	87	

Authorized By: 

Release Date: 12/16/99

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for Inductively Coupled Plasma

Project Name: FUDS Larson Titan S-2

LIMS Project ID: 2910-99

Sample: 99468139 (Matrix Spike - LMX2)

Date Collected: 11/18/99

Method: SW6010

Field ID: TTTS299F1

Date Prepared: 12/03/99

Matrix: Sediment/Soil

Project Officer: Guy Barrett

Date Analyzed: 12/07/99

Units: % Recovery

Analyte	Result	Qualifier
Antimony	15	
Beryllium	100	
Cadmium	96	
Chromium	100	
Copper	99	
Nickel	101	
Silver	92	
Zinc	91	

Authorized By: 

Release Date: 12/16/99

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for Inductively Coupled Plasma

Project Name: FUDS Larson Titan S-2

LIMS Project ID: 2910-99

Sample: 99468141

Date Collected: 11/19/99

Method: SW6010

Field ID: TITS299G1

Date Prepared: 12/03/99

Matrix: Sediment/Soil

Project Officer: Guy Barrett

Date Analyzed: 12/07/99

Units: mg/Kg dw

Analyte	Result	Qualifier
Antimony	5	UJ
Beryllium	1.73	
Cadmium	1.77	
Chromium	14.2	
Copper	19.0	
Nickel	15	
Silver	2	U
Zinc	41.6	

Authorized By: 

Release Date: 12/16/99

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for Inductively Coupled Plasma

Project Name: FUDS Larson Titan S-2

LIMS Project ID: 2910-99

Sample: 99468144

Date Collected: 11/19/99

Method: SW6010

Field ID: TITS299G4

Date Prepared: 12/03/99

Matrix: Sediment/Soil

Project Officer: Guy Barrett

Date Analyzed: 12/07/99

Units: mg/Kg dw

Analyte	Result	Qualifier
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Antimony	5	UJ
Beryllium	1.74	
Cadmium	1.84	
Chromium	15.6	
Copper	18.9	
Nickel	16	
Silver	2	U
Zinc	42.9	

Authorized By: _____

Release Date: _____

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for Inductively Coupled Plasma

Project Name: FUDS Larson Titan S-2

LIMS Project ID: 2910-99

Sample: 99468145

Date Collected: 11/19/99

Method: SW6010

Field ID: TITS299G5

Date Prepared: 12/03/99

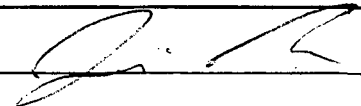
Matrix: Sediment/Soil

Project Officer: Guy Barrett

Date Analyzed: 12/07/99

Units: mg/Kg dw

Analyte	Result	Qualifier
Antimony	5	UJ
Beryllium	1.47	
Cadmium	1.53	
Chromium	9.8	
Copper	16.7	
Nickel	11	
Silver	2	U
Zinc	41.6	

Authorized By: 

Release Date: 12/16/99

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Arsenic

Project Name: FUDS Larson Titan S-2

LIMS Project ID: 2910-99

Project Officer: Guy Barrett

Method: SW7060

Date Reported: 08-DEC-99

Matrix: Sediment/Soil

Analyte: Arsenic

Sample	QC	Field ID	Result	Qualifier	Units	Collected	Analyzed
99468130		TITS299A1	3.46		ug/Kg dw	11/18/99	12/07/99
99468132		TITS299B1	3.03		ug/Kg dw	11/18/99	12/07/99
99468134		TITS299C1	2.7		ug/Kg dw	11/18/99	12/07/99
99468136		TITS299D1	1.0		ug/Kg dw	11/18/99	12/07/99
99468139		TITS299F1	3.39		ug/Kg dw	11/18/99	12/07/99
99468139	Matrix Spike		88 %			11/18/99	12/07/99
99468139	Matrix Spike		84 %			11/18/99	12/07/99
99468141		TITS299G1	3.64		ug/Kg dw	11/19/99	12/07/99
99468144		TITS299G4	4.92		ug/Kg dw	11/19/99	12/07/99
99468145		TITS299G5	2.9		ug/Kg dw	11/19/99	12/07/99
M9337SB1			0.3	U	ug/Kg dw		12/07/99
M9337SL1			107		%		12/07/99

Authorized By:

Randy L. Knox

Release Date:

12/10/99

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Lead

Project Name: FUDS Larson Titan S-2

LIMS Project ID: 2910-99

Project Officer: Guy Barrett

Method: SW7421

Date Reported: 09-DEC-99

Matrix: Sediment/Soil

Analyte: Lead

Sample	QC	Field ID	Result	Qualifier	Units	Collected	Analyzed
99468130		TITS299A1	4.80		mg/Kg dw	11/18/99	12/09/99
99468132		TITS299B1	8.66		mg/Kg dw	11/18/99	12/09/99
99468134		TITS299C1	9.38		mg/Kg dw	11/18/99	12/09/99
99468136		TITS299D1	23.44		mg/Kg dw	11/18/99	12/09/99
99468139		TITS299F1	7.82		mg/Kg dw	11/18/99	12/09/99
99468139	Matrix Spike		78 %			11/18/99	12/09/99
99468139	Matrix Spike		78 %			11/18/99	12/09/99
99468141		TITS299G1	7.08		mg/Kg dw	11/19/99	12/09/99
99468144		TITS299G4	9.59		mg/Kg dw	11/19/99	12/09/99
99468145		TITS299G5	6.21		mg/Kg dw	11/19/99	12/09/99
M9337SB1			0.2	U	mg/Kg dw		12/09/99
M9337SL1			105		%		12/09/99

Authorized By:

Bandy S. Knox

Release Date:

12/10/99

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Selenium

Project Name: FUDS Larson Titan S-2

LIMS Project ID: 2910-99

Project Officer: Guy Barrett

Method: SW7740

Date Reported: 08-DEC-99

Matrix: Sediment/Soil

Analyte: Selenium

Sample	QC	Field ID	Result	Qualifier	Units	Collected	Analyzed
99468130		TITS299A1	0.3	U	mg/Kg dw	11/18/99	12/07/99
99468132		TITS299B1	0.3	U	mg/Kg dw	11/18/99	12/07/99
99468134		TITS299C1	0.3	U	mg/Kg dw	11/18/99	12/07/99
99468136		TITS299D1	0.3	U	mg/Kg dw	11/18/99	12/07/99
99468139		TITS299F1	0.3	U	mg/Kg dw	11/18/99	12/07/99
99468139	Matrix Spike		100 %			11/18/99	12/07/99
99468139	Matrix Spike		108 %			11/18/99	12/07/99
99468141		TITS299G1	0.3	U	mg/Kg dw	11/19/99	12/07/99
99468144		TITS299G4	0.3	U	mg/Kg dw	11/19/99	12/07/99
99468145		TITS299G5	0.3	U	mg/Kg dw	11/19/99	12/07/99
M9337SB1			0.3	U	mg/Kg dw		12/07/99
M9337SL1			91		%		12/07/99

Authorized By:

Randy J. Knox

Release Date:

12/10/99

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Thallium

Project Name: FUDS Larson Titan S-2

LIMS Project ID: 2910-99

Project Officer: Guy Barrett
Date Reported: 13-DEC-99

Method: SW7841
Matrix: Sediment/Soil
Analyte: Thallium

Sample	QC	Field ID	Result	Qualifier	Units	Collected	Analyzed
99468130		TITS299A1	0.6	U	mg/Kg dw	11/18/99	12/10/99
99468132		TITS299B1	0.6	U	mg/Kg dw	11/18/99	12/10/99
99468134		TITS299C1	0.6	U	mg/Kg dw	11/18/99	12/10/99
99468136		TITS299D1	0.6	U	mg/Kg dw	11/18/99	12/10/99
99468139		TITS299F1	0.6	U	mg/Kg dw	11/18/99	12/10/99
99468139	Matrix Spike		92 %			11/18/99	12/10/99
99468139	Matrix Spike		91 %			11/18/99	12/10/99
99468141		TITS299G1	0.6	U	mg/Kg dw	11/19/99	12/10/99
99468144		TITS299G4	0.69		mg/Kg dw	11/19/99	12/10/99
99468145		TITS299G5	0.6	U	mg/Kg dw	11/19/99	12/10/99
M9337SB1			0.6	U	mg/Kg dw		12/10/99
M9337SL1			99		%		12/10/99

Authorized By:

Randy L. Knox

Release Date:

12/13/99

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Mercury

Project Name: FUDS Larson Titan S-2

LIMS Project ID: 2910-99

Project Officer: Guy Barrett
Date Reported: 24-NOV-99

Method: EPA245.5
Matrix: Sediment/Soil
Analyte: Mercury

Sample	QC	Field ID	Result	Qualifier	Units	Collected	Analyzed
99468130		TITS299A1	0.025		mg/Kg dw	11/18/99	11/24/99
99468132		TITS299B1	0.011		mg/Kg dw	11/18/99	11/24/99
99468134		TITS299C1	0.0092		mg/Kg dw	11/18/99	11/24/99
99468136		TITS299D1	0.174		mg/Kg dw	11/18/99	11/24/99
99468139		TITS299F1	0.010		mg/Kg dw	11/18/99	11/24/99
99468141		TITS299G1	0.017		mg/Kg dw	11/19/99	11/24/99
99468144		TITS299G4	0.020		mg/Kg dw	11/19/99	11/24/99
99468145		TITS299G5	0.014		mg/Kg dw	11/19/99	11/24/99
99468145	Duplicate		0.012		mg/Kg dw	11/19/99	11/24/99
99468145	Matrix Spike		109 %			11/19/99	11/24/99
99468145	Matrix Spike		111 %			11/19/99	11/24/99
M9327SG			105		%		11/24/99
M9327SH			0.005	U	mg/Kg dw		11/24/99

Authorized By: Sally Gull

Release Date: 11/24/99

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Department of Ecology
Manchester Environmental Laboratory
Project Statement

Project Name: FUDS Larson Titan S-2

LIMS Project ID: 2910-99

Project Officer: Barrett, Guy

Start Date: 11/22/99

Location: HQ

Due Date: 12/22/99

Program: TCP

Statement Date: 12/22/99

Samples:

Parameter	Matrix	Method	Lab	Qty	Unit Price	Extended Price
PPMETS	40	SW7841	ECO	8	\$ 169	\$ 1,352
TPHD	40	NWTPH-DX	ECO	7	\$ 112	\$ 784
VOA	40	SW8260	ECO	1	\$ 169	\$ 169

QC:

Parameter	Matrix	Method	Lab	Qty	Unit Price	Extended Price
PPMETS	40	SW7841	ECO	1	\$ 0	\$ 0
PPMETS	40	SW7841	ECO	4	\$ 169	\$ 676
TPHD	40	NWTPH-DX	ECO	1	\$ 112	\$ 112
VOA	40	SW8260	ECO	2	\$ 169	\$ 338

Total Preparation Charges: \$ 408

Method	Type	Matrix	Samples	Rate	Total
HG-PREP	PREP	40	12	\$ 17	\$ 204
SW3050	PREP	40	12	\$ 17	\$ 204

PIC	%	In House	Contract	Generals	Metals	Organics	Bioassay	Special	Total
J2F11	100	\$ 3,839	\$ 0	\$ 0	\$ 2,436	\$ 1,403	\$ 0	\$ 0	\$ 3,839

Totals:		\$ 3,839	\$ 0	\$ 0	\$ 2,436	\$ 1,403	\$ 0	\$ 0	\$ 3,839
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I

I. Conclusions

The Washington State Department of Ecology investigated the FUDS Larson AFB Titan Missile Facility S-2 on November 18, 1999. Based on results from laboratory analysis of samples taken at this site, Ecology found exceedances of lubricating oil in the soil at this site. Ecology therefore does not concur with the No Further Action (NOFA) required determination made by the Seattle District Corps of Engineers at the FUDS Larson AFB Titan Missile Facility S-2 and will update its database to reflect this.

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